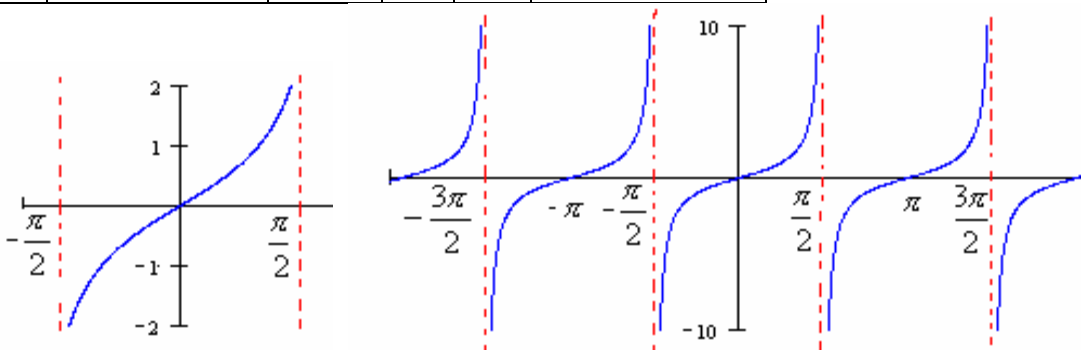


5.6 Graphs of the Other Trigonometric Functions

Example #1 Graph $y = \tan x$

x	$-\frac{\pi}{2}$	$-\frac{\pi}{4}$	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$
tanx	undefined	-1	0	1	undefined



Note: The graph of $y = \tan x$.

- Period is π .
- Vertical asymptotes are $x = -\pi/2$ and $x = \pi/2, \dots$

Graph of $y = a \tan bx$.

- Period is $\frac{\pi}{|b|}$.
- $x = 0$ is x-intercept.
- $x = -\frac{\pi}{2b}$ and $x = \frac{\pi}{2b}$ are vertical asymptotes.
- If $a < 0$, the graph reflected through x-axis.
- If $|a| < 1$, the graph is shrinking.
- If $|a| > 1$, the graph is stretching.

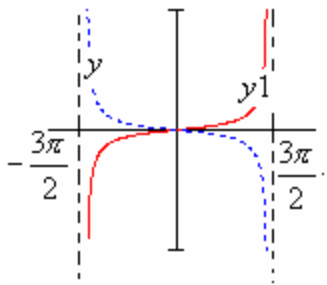
Example #2 Graph $y = -\frac{1}{2} \tan \frac{x}{3}$

Solution

$$y1 = \frac{1}{2} \tan \frac{x}{3} = \frac{1}{2} \tan\left(\frac{1}{3}x\right) \rightarrow a = \frac{1}{2} \text{ and } b = \frac{1}{3}$$

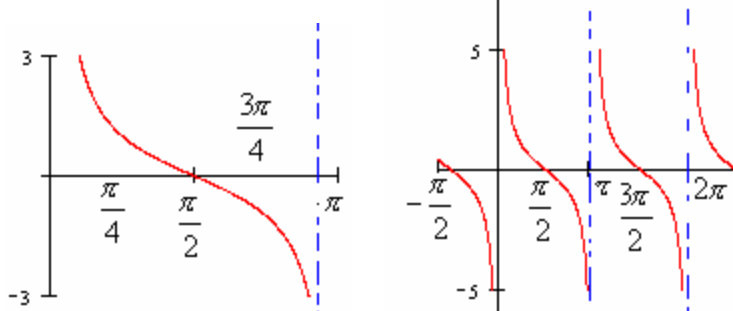
Period $P = \frac{\pi}{|b|} = \frac{\pi}{1/3} = 3\pi$, asymptotes are

$$x = -\frac{\pi}{2b} = -\frac{\pi}{2(1/3)} = -\frac{3\pi}{2} \text{ and } x = \frac{\pi}{2b} = \frac{\pi}{2(1/3)} = \frac{3\pi}{2}$$



Example#3 Graph $y = \cot x$

x	0	$\pi/4$	$\pi/2$	$3\pi/4$	π
cotx	Undef.	1	0	-1	Undef.



The Graph of $y = a \cot bx$

- The period is $\frac{\pi}{b}$
- The vertical asymptotes are $x = 0$ and $x = \frac{\pi}{b}$
- X-intercept $x = \frac{\pi}{2b}$
- If $a < 0$, the graph is reflected across the x-axis.

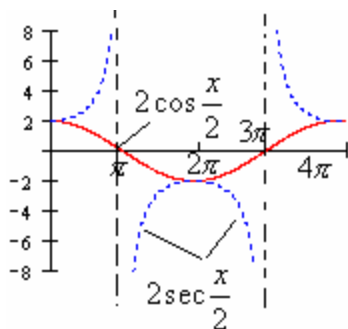
Example#4 Graph $y = 2 \cot(2x)$

The Graph of $y = a \sec bx$

- First sketch the graph of $y = a \cos bx$ and draw vertical asymptotes through the zeros.
- Period of $y = a \sec bx$ is $\frac{2\pi}{b}$
- Range is $(-\infty, -a] \cup [a, \infty)$

Example#5 Graph $y = 2 \sec \frac{x}{2}$

First graph $y = 2 \cos \frac{x}{2}$, period $P = \frac{2\pi}{1/2} = 4\pi$



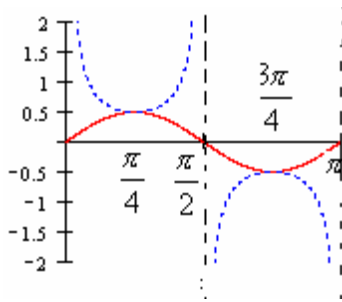
range $(-\infty, -2] \cup [2, \infty)$

The Graph of $y = a \csc bx$

- First sketch the graph of $y = a \sin bx$ and draw vertical asymptotes through the zeros.
- Period of $y = a \csc bx$ is $\frac{2\pi}{b}$
- Range is $(-\infty, -a] \cup [a, \infty)$.

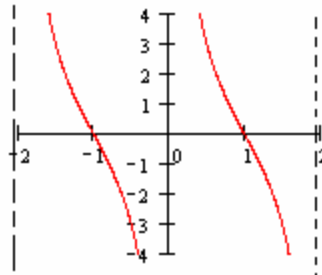
Example#6 Graph $y = \frac{1}{2} \csc 2x$

First sketch the graph of $y = \frac{1}{2} \sin 2x$, period $P = \frac{2\pi}{2}$



$$\text{range} \left(-\infty, -\frac{1}{2} \right] \cup \left[\frac{1}{2}, \infty \right)$$

Example#7 Find an equation of the graph



The equation is $y = \cot bx$

Period is the distance between two V.A.

$$P = \frac{\pi}{b} = 2 \rightarrow b = \frac{\pi}{2}$$

$$\text{Then } y = \cot\left(\frac{\pi}{2}x\right)$$